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Assessent of elliptic solvers for the pressure Poisson equation J.P. STRODTBECK, J.B. POLLY, J.M. MCDONOUGH, University of Kentucky — It is well known that as much as 80% of the total arithmetic needed for a solution of the incompressible Navier–Stokes equations can be expended for solving the pressure Poisson equation, and this has long been one of the prime motivations for study of elliptic solvers. In recent years various Krylov-subspace methods have begun to receive wide use because of their rapid convergence rates and automatic generation of iteration parameters. However, it is actually total floating-point arithmetic operations that must be of concern when selecting a solver for CFD, and not simply required number of iterations. In the present study we recast speed of convergence for typical CFD pressure Poisson problems in terms of CPU time spent on floating-point arithmetic and demonstrate that in many cases simple successive-overrelaxation (SOR) methods are as effective as some of the popular Krylov-subspace techniques such as BiCGStab(l) provided optimal SOR iteration parameters are employed; furthermore, SOR procedures require significantly less memory. We then describe some techniques for automatically predicting optimal SOR parameters.

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